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CHRONIC TOXICITY OF A PROPOSED AQUACULTURE DRUG TO DAPHNIA IN A FLOW THROUGH CONTINUOUS EXPOSURE TEST SYSTEM

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Abstract

The study was designed in accordance with guidance given in ASTM Designation E 1193-97, Standard Guide for Conducting *Daphnia magna* Life Cycle Toxicity Tests. Daphnia were continuously exposed to hydrogen peroxide for 21-days. Hydrogen peroxide had a negative effect on daphnia growth. Concentrations less than 2.5 mg/L had no effect on the time to first brood production and the number of broods produced. Concentrations less than 1.25 mg/L had no effect on the total number of young produced.

Less than 24 h old daphnia

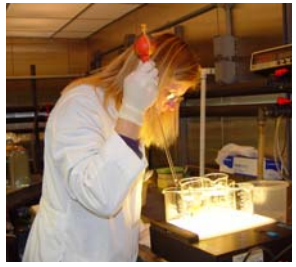
Introduction

U.S. Food and Drug Administration (FDA) approval is being sought for the use of hydrogen peroxide as a therapeutic aquaculture drug because of it's effectiveness preventing and controlling external bacterial, fungal and parasitic infections. Before hydrogen peroxide can be approved for use, the FDA must accept data characterizing the chemical's environmental safety. A study was designed to determine the hydrogen peroxide concentrations that have no effect on survival, growth, time to first brood, and total number of young produced from adult *Daphnia magna* continuously exposed for 21 days in a flow through test system.

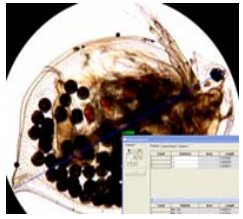
Methods

The experimental design included six test groups with target hydrogen peroxide concentrations of 0.0, 0.32, 0.63, 1.25, 2.5, and 5.0 mg/L. Each test group consisted of 10 test chambers. Each chamber was randomly assigned to one of ten blocks so that each test group was represented in each block; a randomized block design in a 2 x 3 configuration. *Daphnia magna* were continuously exposed to hydrogen peroxide for 21-days in chambers (volume 205 mL) with continuous flow (about 5 mL/min).

Daphnia were fed five times during week days and three times during weekend days.



Production was assessed by enumerating young daily.



Growth was assessed by measuring length with Image Pro Express® software. Images were generated with a Nikon microscope and digital camera.

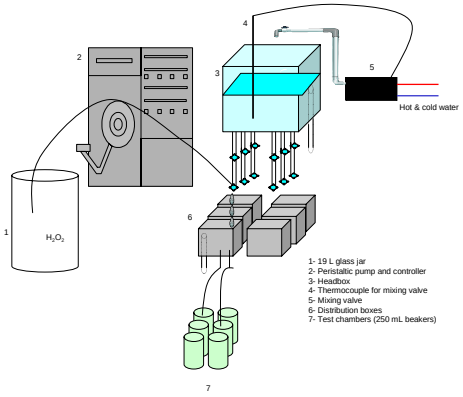
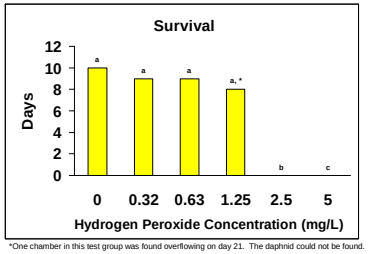
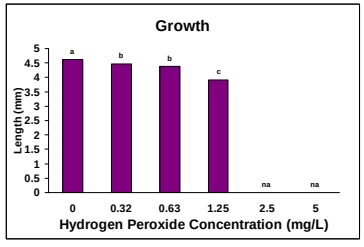


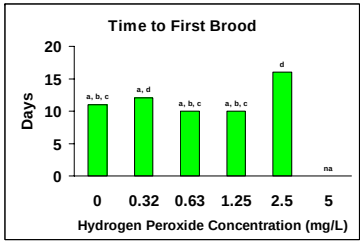
Diagram of the flow-through test system.

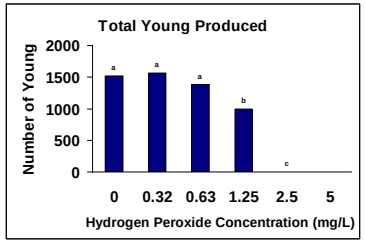
Results

Data with a common letter are not statistically different ($P > 0.05$; na = not applicable).









*One chamber in this test group was found overflowing on day 21. The daphnid could not be found.

Conclusions

Hydrogen peroxide concentrations of:

≤ 1.25 mg/L did not increase the probability of death

≥ 0.32 mg/L reduced daphnia growth relative to untreated controls

≤ 1.25 mg/L had no effect on the time to first brood production

≤ 1.25 mg/L had no effect on the number of broods produced

≤ 0.63 mg/L had no effect on the total number of young produced